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Aside from pycnidia on the leaves, the development of *Fenestella platani* is as follows:

The ascospores give rise to a mycelium which immediately cuts off gonidia—the *Acrostalagmus* stage. Later the mycelium develops into a stroma in which pycnidia are formed—the *Cytispora* stage. Finally perithecia break out of the stroma between the pycnidia—the *Fenestella* stage. Cultures of *Acrostalagmus* reproduced the same gonidial form, and no pycnidia; cultures of *Cytispora* both artificial and natural yielded the same pycnidia again. Under favorable circumstances, however, perithecia might be developed.

If the pycnidia that occur on the leaves really belong to *Fenestella*, then this fungus possesses both a parasitic and saprophytic cycle of development. The uncertainty which still exists in regard to this makes it undesirable to go farther in order to draw general conclusions.

(*To be continued.*)

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## PEACH ROT AND PEACH BLIGHT.

(*Monilia fructigena*, Persoon.)

By Erwin F. Smith, Sc. D.

For six years my attention has been drawn repeatedly to the serious losses resulting from the parasitism of *Monilia fructigena* upon plums and other stone fruits, and during the last three years my opportunities for observing its effect upon the peach have been unrivaled. These opportunities occurred principally in the great peach district lying between the Chesapeake and Delaware Bays. There, in the prosecution of the peach-yellows investigation, I have examined hundreds of orchards at all seasons of the year, and have incidentally made some very interesting observations on other diseases of the peach, particularly that resulting from the *Monilia*. It has also been my fortune to see this disease in the peach-belt of southwestern Michigan.

This fungus is more common, and far more destructive than any other observed on the peach in this country. It is rarely absent from the orchard, and in rainy weather it frequently destroys from one-half to three-fourths of the crop, in some cases the entire crop. Under its influence the fruit quickly loses its normal color and flavor, and becomes an entire loss to the grower. As the fungus invades the healthy tissues of the fruit the latter become leather-colored, or dark brown, and the peach is said to "rot," although, as Von Thümen first pointed out, the change is not strictly a rot. For the purposes of this paper it will, however, be convenient to follow the well-established popular usage and speak of this disease as the "peach rot."

So rapid are the changes induced by this fungus that sometimes the greater part of entire varieties, representing thousands of dollars, may be lost in three or four days. At such times, fruit picked in an apparently sound condition is also very likely to rot on its way to market or in the hands of middlemen or consumers. Of late years peaches grown in Georgia and the far South have been especially troubled by rot during shipment. These peaches ripen in the hot weather of mid-summer and are sent long distances to Northern markets. The loss to Georgia growers is sometimes as much as two-thirds the whole crop. Could this rot be stopped the profit of peach growing the country over would be much increased—probably doubled. This general statement is based on observation and on inquiries among peach growers in a half dozen States. The peach is well known to be a delicate and perishable fruit, but it is not so generally known through just what agencies this decay occurs. An examination, however, of the fruit stalls in any city market, especially during hot and moist weather, will satisfy the most skeptical that this omnipresent fungus is the chief cause of the rapid decay, in fact, almost the sole cause.

Peaches uninjured by *Monilia* and missed in gathering sometimes hang on the trees several weeks, the skin remaining bright but the flesh becoming very soft and of a subvinous flavor. Fruit growers, as a rule, are entirely ignorant of the presence of any fungus. They do not know the cause of the rot but are painfully conscious of the result, since the latter can be expressed in pecuniary terms. The rot is frequently known as "scald" and is usually ascribed to hot and wet weather, but in this instance, as in many others, the weather is only a favoring condition, the real cause, the *sine qua non*, being the fungus, whose ash-gray spore-tufts are so often seen on the shrunken and discolored surface of the peach.

If the consensus of opinion among peach growers is of any value this rot is most uniformly destructive to early peaches, a very considerable portion of which rot every year. Whether this tendency in early varieties is due to a thinner skin, or to hotter weather during the time of their maturing, I am unable to say positively. It has been ascribed to the former and may in part be due to this, but I am not aware of any extensive series of observations made to determine the relative thickness or resisting power of peach skins. That this or some other unknown varietal peculiarity somewhat affects the spread of the disease is not improbable. I did think that certain of the early sorts, *e. g.*, Hale's Early, were specially subject to rot, but have given up this view as untenable. All the very early varieties rot badly, though in the same orchard not always to the same extent.

The well-known influence of moisture and especially of high temperature upon the rapid development of the fungus, facts which I have observed repeatedly in the orchard and have verified in the laboratory, lead me to think that the frequent rains and usual hot weather of July and the first part of August must be the principal reason why early varieties always rot more or less, and generally much worse than middle or late sorts. It would, however, be a mistake to suppose that any variety is wholly exempt. Even sorts with the firmest flesh, *e. g.*, Troth's Early and Smock, perish very quickly if the meteorological conditions are favorable to the growth of the fungus. A single rain near the period of ripening will often immediately double or treble the number of rotting fruits.

It is also a great mistake to suppose the skin of the peach must first be punctured by insects or injured in some other way before the fungus can find an entrance. Every peach grower of long experience knows that this is not true, and any one can satisfy himself on this point by giving to the subject a little patient consideration. Injured fruits are more easily infected; that is all. In years of abundance only a small proportion of the peaches which remain on the trees are punctured by the curculio or otherwise injured, yet the entire crop may rot very quickly during a rainy period, or during a series of hot days, with occasional rains or heavy dews. Moreover, in the laboratory I have infected the soundest peaches by merely sowing a few *Monilia* spores in a drop of water upon their surface, the control spots remaining entirely sound. To be most successful this experiment must be conducted in an atmosphere nearly saturated with vapor of water and at a temperature not much below 90° F. In the laboratory, as well as in the field, an increase in temperature of 10° to 20° above the normal causes an astonishing increase in the rapidity of the rot.

Some reference to the actual losses resulting from this rot during the autumn of 1888 will serve to show what happens not infrequently, and will afford ample basis for judgment as to the economic importance of restrictive measures.

The peach crop of the Delaware and Chesapeake Peninsula is well known to have been unusually abundant in 1888. I traveled extensively in six counties and saw for myself. All varieties fruited and the orchards bent under the weight of their precious burden. Even old, broken, neglected trees, in fence rows and pastures, were full of fruit. The early and middle varieties were gathered uninjured, except by a single windstorm, and were sold at prices ranging from 50 cents to $1.25 and upwards a basket. Until the end of the first week in September there was also every prospect for a very large crop of Smock and similar productive late peaches, which are planted very extensively for drying purposes. September 7 rainy weather set in over the upper part of the Peninsula, and continued almost uninterruptedly for five or six days. When it was not actually raining it was lowering and the air was full of moisture. These remarks apply especially to the counties of Kent and Cecil in Maryland and to Kent and New Castle in Delaware. At this date the Smock peaches were almost or quite ready to pick. The weather was not excessively warm, but the rain was so nearly continuous, and the spores of the *Monilia* were so widespread, that a veritable epiphytotic ensued.* Every day thousands of baskets of green and ripening peaches rotted upon the trees and on the way to market.

In consequence of this rot the late peaches were nowhere very profitable, and in many instances were an entire loss. The daily railroad shipments, instead of increasing with the coming on of the Smock, fell off within a few days from scores of car loads to a few dozen, and must have fallen away almost to nothing had only sound peaches been shipped. The condition of much of the fruit forwarded during this week is sufficiently characterized by the following clipping from a Philadelphia daily of September 15:

> The local peach market is utterly demoralized, not on account of the quantity of fruit but on account of the quality. No such mess called peaches was ever marketed before as has been arriving during the past few days. The season is practically ended and but few more good Delaware peaches will be received.

The total shipment of peaches over the Delaware Railway from September 9 to September 17 was but 711 car-loads; on September 14, 15, and 17, it was respectively only 46, 35, and 30 car-loads. None were shipped on Sunday, the 16th, and none of any consequence after the 17th. The shipments for four weeks previous to this time, August 13 to September 8, averaged about 195 car-loads per day. These spoiled peaches went begging at prices ranging from 7 to 25 cents per basket, the most of them being sold for 10 or 15 cents. At that time good fruit readily commanded 59 to 65 cents per basket of five-eighths bushel.

From intelligent and trustworthy peach growers on the Peninsula I have received many oral and written statements like the following, the amount of individual loss varying from a few baskets to many thousand, according to the acreage and the varieties planted:

> In my orchard in Kent County, Md., probably 500 baskets (6,000 trees). In the county at large many thousands of baskets were probably lost.—[Dr. John J. Black, New Castle, Del.]
>
> My own loss was perhaps 3,000 baskets.—[Dr. Henry Ridgely, Dover, Del.]
>
> I lost 4,000 baskets.—[Norris Barnard, Still Pond, Md.]
>
> My individual loss was not less than 2,000 baskets from an orchard of 6,000 trees.—[W. H. Burnite, Felton, Del.]
>
> I am satisfied that my loss was from 5,000 to 6,000 baskets.—[James S. Harris, Still Pond, Md.]
>
> My loss was about 7,000 baskets.—[Thomas D. France, Chestertown, Md.]
>
> I lost from 10,000 to 15,000 baskets, 3,000 baskets rotting on their way to market.—[F. H. Harper, Still Pond, Md.]
>
> In the week you speak of I lost 20,000 baskets. * * * We lost all our fruit that ripened after the Crawford's Late. The varieties lost will number at least one-half of all our orchards. In mine they represented two-thirds.—[Wilbur Eliason, Chestertown, Md.]

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*Aside from the repeated precipitation the principal peculiarity of the weather was the slight range of temperature. The variation at Dover during seventy-eight hours (a. m. of September 8 to p. m. of September 11) was only 14° F., while for the first thirty-six hours it kept between 70° and 82°, and did not at any time fall below 68°. After this the range was greater, but during the next five days the day temperature was above 70° four times and touched 83° on the 16th.

Mr. France estimates the loss in his county (Kent, Md.) at 400,000 baskets. Mr. Eliason (same county) also places the loss at 400,000 baskets. Mr. Harris (same county) thinks the loss was from one-fifth to one-sixth of the entire crop.

Norris Barnard estimates the loss on the Peninsula at one fourth of the whole crop. W. H. Burnite places the loss on the Peninsula at "one-sixth of the entire crop." Dr. Ridgely states that, at the time, the estimated money loss was $300,000.

Assuming the loss to have been only one-sixth of the total crop, and the value only 50 cents per basket, we have an approximate total loss of 800,000 baskets, worth $400,000. On first thought this seems like a rash or inflated statement. A personal acquaintance, however, with the orchards of this entire region, and a knowledge of the great extent to which Smock and other late peaches are planted, leads me to believe it is entirely warranted. In fact, it is probably under the actual loss, for in the upper part of the district in question these varieties are found in almost every orchard, while in many they include thousands of trees.*

This estimate is also established by the fact that in spite of the rot, and not counting the enormous number of peaches canned, dried, consumed, and sent away by water, the shipments from the Chesapeake and Delaware peninsula, by railroad alone, were upwards of 3,000,000 baskets (five eighths of a bushel), worth probably over $2,000,000—a crop only distanced by that of the famous year 1875, when the railroad shipments exceeded 4,500,000 baskets. But for the rot, the peach shipment of 1888 would undoubtedly have been nearly or quite equal to that of 1875, since in a productive year like 1888 the varieties which ripen after Crawford's Late are generally equal to about one-third of the whole crop.

This enormous loss of more than 800,000 baskets is to be attributed almost wholly to the destructive activity of the rot fungus. Could this fungus have been destroyed completely on the 1st day of September, or earlier in the season, the rot would not have appeared. Could it have been partially exterminated, the rot would have been proportionately less.

In this fungus the common mode of propagation from peach to peach, and the only known one, is by means of ash-gray conidia, which are produced in great numbers on the brown surface of the affected parts. These spores generally occur in little hemispherical tufts or confluent masses on bundles of hyphal threads which have burst through the skin of the peach. The mycelium ramifies abundantly in the decaying tissues and the number of conidial tufts visible on the surface seems to depend to a considerable extent on the amount of moisture in the air and on the length of time the peach has been affected. From these little, dusty, ash-colored tufts, which every peach grower must have observed, the infection is very readily transmitted to healthy peaches. Rains, winds, birds, insects, etc., all help to disseminate the spores and those which find suitable lodgment are very likely to germinate and extend the disease if the atmospheric conditions are at all favorable. Of course myriads of spores miscarry and other myriads perish before germination or during its progress, otherwise the peach and kindred fruits must long since have perished from the earth. Ample provision, however, has been made for the perpetuation of this parasite by endowing it with a fecundity which more than compensates for the small size and perishable nature of its spores. After some weeks, however, the conidia cease to be produced and the ash-gray tufts gradually disappear.

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*Since this was written I have talked with Superintendent I. N. Mills, who informs me that the estimate of the railroad company's agent, after traveling over the territory in question, was 1,000,000 baskets, while the sum total of estimates sent in by the local freight agents was one-half greater. Mr. Mills himself places the loss at about 1,200,000 baskets.

The disappearance of the conidial tufts is not, however, the end of the fungus. This winters over as a resting mycelium in the destroyed peaches which have either fallen to the earth or still hang upon the branches in a dry, wrinkled, mummified state. Early in the spring, if the atmospheric conditions are favorable, the fungus awakes to renewed activity—another crop of conidia is produced from new tufts borne on the old mycelium and the work of destruction begins anew. In the spring of 1889 I witnessed this for the first time, and was able to settle beyond doubt that the fungus winters over in the decayed fruits, especially in those which remain hanging upon the trees. This fact is one of great practical importance. The ordinary spores (conidia) being of a perishable nature it has occurred to many mycologists that *Monilia* must exist during a portion of the year under some other form—one capable of passing in safety through the inclement season. With this thought in mind I had been watching the fungus very narrowly for several seasons, but all to no purpose until May of this year. Then, thanks to a very rainy week, I came suddenly upon the explanation I was seeking.

Earlier in the year, when the peaches were in blossom and beginning to put forth their foliage, I was in the Delaware orchards, and was greatly perplexed to find the *Monilia* appearing suddenly everywhere on the blossoms and young fruit. This was first observed about April 29, in moist weather, soon after an unprecedentedly heavy and prolonged rain-fall.*

The orchards blossomed abundantly, but the greater part of the peach crop in four counties was destroyed at this time. There had been no frosts of any consequence and the loss was generally ascribed to the rain. This was said to have washed off the pollen, but most of the orchards were just out of blossom when the rains began, and the real agent of destruction was the rot-fungus, favored, of course, by the excessive precipitation. The loss from this source in April and May, 1889, in all probability exceeded 500,000 baskets. The rot was also very bad in June and July. Hundreds of orchards in the upper portion of the peninsula produced no peaches whatever, and the railroad shipment from the whole district was only about one-half that of 1888.

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*At Dover it poured continually for twenty hours (8 p. m. of 25th to 4 p. m. of 26th), and reports from the upper portion of the peninsula also indicated a very heavy rainfall. It also rained in showers on the 27th, all day. The precipitation at Dover from the first storm must have been at least six inches. A few peach-orchards were then in full blossom, but the majority were a day or two in advance and nearly or quite out of blossom.

Previously I was not aware that *Monilia* made its appearance so early. I had looked upon it rather as a summer or autumn fungus, but here it was in April.

Whence came the rot so suddenly? I could not tell; but in Maryland a few weeks later, during another rainy week, I saw all at once clearly what I failed to see in Delaware. This was May 16, when the young peaches were about the size of filberts or a little larger. From time to time all the winter and spring I had been inspecting the fungus-destroyed fruits of the previous season, hoping to find something. On this date I was working at another subject in a large orchard where fruit rotted the previous year. The prolonged rains had thoroughly softened the mummified peaches still clinging to the branches. Casually examining one of these, for perhaps the twentieth time, I was astonished to find its surface covered with the familiar conidial tufts. Previous to the rains I had been in that orchard, and there and elsewhere I had examined hundreds of the mummified fruits without finding a vestige of the spore-tufts of the previous summer. Indeed, the rains and winds generally destroy all traces before winter sets in, yet here they were as abundant and fresh in appearance as if grown from a newly-rotted peach. This discovery led to a careful search. On that day, and the wet ones immediately following, I found dozens of mummified fruits covered with the ash-gray tufts. In fact, about one-third of all I examined bore conidial tufts, and in no case were these the growth of the previous season. They had recently pushed from the interior of the rain-softened peaches, and they were particularly abundant after a prolonged, soaking rain. In a series of careful experiments under suitable control, I experienced no difficulty in infecting and rotting green peaches, plums, and cherries with conidia taken from these tufts. At that time, and especially some days later, great numbers of the young peaches perished from a natural infection during a continuance of the rainy weather, the mummified peaches being plentiful and their spore-dust abundant and easily disseminated.

My observations on this point confirm those made by Dr. J. C. Arthur on the cherry in 1885* and by Dr Paul Sorauer on the apple in 1889.†

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* Fourth An. Rep. N. Y. Agric. Exp. Sta. for 1885, p. 255.

†*Hamburger Garten- und Blumenzeitung*, 1889, Heft. I, p. 10–13.

They leave no doubt as to where and how this parasite passes the winter season.

This wide-spread and destructive fungus has naturally received considerable attention from mycologists, although the published accounts, especially the European, are somewhat meager. It is apparently more common and destructive in this country than in Europe, for it is not even mentioned in Winter's *Die durch Pilze verursachten Krankheiten der Kultur Gewächse*, or Von Thümen's *Die Bekämpfung der Pilzkrankheiten.* The summer form has been seen and described repeatedly, but no one has been able to connect these perishable organs with any other fungus, or to find resting spores. The cycle of development has remained hidden, and all attempts at prevention have therefore been simply gropings in the dark. Woronin has recently suggested that this fungus may be the conidial state of some *Peziza.* The fungus, for aught we know, may have an ascosporous form belonging to this or some kindred group, but such a form has never been seen and is unnecessary to the completion of its annual cycle. Moreover, if the fungus once produced asci, it may have lost this power during the lapse of ages. However this may be, it is certain that the mycelium which winters over in the dried tissues is amply sufficient to reproduce the plant each spring. This would still be true if it retained its vitality in only now and then a rotted fruit, for under favorable circumstances the mycelium in a single peach may produce a thousand or even two thousand conidial tufts, and each one is certainly capable of producing from five hundred to a thousand spores.

That the fungus may sometimes winter over in the twigs of the peach is also possible, for not only is the fruit destroyed in the manner just described, but sometimes growing shoots are also attacked and killed.

When the rot appears in the twigs it is commonly called "blight." I first discovered this blight in the summer of 1887, in Delaware, where it was unusually prevalent. Trees thus attacked present a very peculiar appearance, quite suggestive of blight in the apple and pear, only in the peach the destruction appears to be confined principally to twigs, the injury seldom extending to branches which have formed more than two annual rings. The reason for this is apparent, or at least not far to seek. Peaches are borne on very short pedicels on branches of last season's growth, and beyond their point of attachment there is usually from 3 to 18 inches of leafy elongating shoot axis, which will mature buds for the fruit and branches of the following season. In summer and autumn the blight of peach stems is always, or almost always, traceable to infection derived from mycelium. The spores do not figure here. This mycelium originates in the rotting peach; bores through the pedicel into the stem; ramifies in the latter, especially near the place of its entrance; and quickly destroys all the distal portion of the branch. Frequently the twig dies back a few inches further than the point of attachment of the peach, and sometimes a much greater distance, especially if all the foliage-bearing shoots are killed. The *direct* injury appears, however, to be confined principally to that part of the stem in the immediate vicinity of the peach. There the tissues of the stem are browned and killed by the parasite. The distal portion of the stem, the leafy shoot axis, often shows no trace of the fungus, but dries up as if girdled. Of hundreds of blighted stems examined in 1887, I saw none which were not associated with rotted peaches. Last summer and this summer I observed the same fact, although the blight was less prevalent. The earliest varieties blight most, and trees not in fruit never blight at this time of year. In the early spring, however, the young and tender shoots must be infected by spores. Many such shoots were attacked and killed in 1889.*

As a rule the fungus produces its conidial tufts much less frequently on stems than on fruit. Occasionally I have seen them on branches of the previous season's growth, but generally they are more abundant on tissues only recently out of the meristematic condition, *e. g.* on young stems in early spring.

This twig blight is well known to peach growers in Maryland and Delaware, and has been for years, although I have never seen any printed statement of the fact. In wet seasons it sometimes does more injury than the rot, because when many branches are destroyed the tree is not only injured, but the next year's crop is proportionately reduced. In some instances I have seen as many as one hundred blighted twigs on a single tree, the crown of green foliage being curiously interspersed with dead stems and withered leaves. Certain observant peach growers, to whom I mentioned the dependence of blight upon rot, assured me that they knew it already and could and did prevent it by promptly removing the rotting fruits. One man of large experience has known trees to be much injured by neglect of this precaution.

This paper, in which I have purposely avoided all questions of histology, would not be complete without some reference to means of prevention. The difficulties in the way of preventive treatment are great on account of the omnivorous nature of the fungus, yet I believe that they may be overcome and that a large measure of protection is quite within the range of possibilities.

I have quickly induced the rot in apples, pears, and peaches with spores taken from the plum; in cherries and plums with spores taken from the peach; in peaches and plums with spores taken from the cherry. The fungus infecting all these fruits is apparently one and the same. It occurs destructively on peaches, apricots, plums, and cherries, to some extent also on apples, pears, and quinces. It has also been reported as growing on grapes, gourds, the medlar, and *Cornus mas.* Dr. Arthur induced it to grow on blackberries, and Sorauer on green hazelnuts. I also found it to grow in green rose hips, but not vigorously, even under seemingly favorable conditions. The shrubby and arborescent *Pomeæ* and *Pruneæ*, especially the stone fruits, are the principal sources of infection. If we could control the disease in our orchards, the danger from outside sources would be slight.

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* This blight must not be confused with that caused by a small larva which bores in the ends of the stems in early spring, and sometimes does considerable injury.

The question of treatment naturally divides into two portions (*a*) orchard hygiene and (*b*) use of fungicides.

From what has been said it is apparent that two factors are necessary to the production of the rot:

(1) The presence of the rot fungus;

(2) The existence of meteorological conditions favorable to its rapid development.

The control of meteorological phenomena being impossible, the question arises: Can the rot be held in check by the destruction of the fungus? Fortunately we are able to give an affirmative answer. In this connection the importance of knowing where the fungus passes the winter becomes strikingly apparent. If its preservation through the winter and its reproduction in the spring depend wholly or in great part upon the existence of a dormant mycelium, then the systematic gathering and burying or burning of all rotten fruits in summer and autumn will very materially lessen the prevalence of the rot. Especially will this be true if the work of destruction is continued year after year as all work of this kind must be. The remedy here proposed rests on sound principles and is both practicable and practical. If applied on a large scale, systematically, throughout a peach district, and for a series of years, it could not fail to bring decided results. To be very successful it must be done thoroughly and by united effort. Too much stress can not be laid upon the removal and destruction of all the rotted fruits. *None must be left upon the ground or upon the trees.* Moreover, all the fruit-growers of a locality must unite if they would get the best results from this method, which is precisely that recommended for the extermination of noxious weeds, *i. e.*, allow none to go to seed.

Every husbandman knows that, in spite of thrift and painstaking, the farms of a whole community are threatened if only one man allows his fields to become the nursery of bad weeds. From the fields of this careless or negligent person the seeds of pestiferous plants are carried by animals, washed by rains, blown by winds, or transported by the hand of man outward in all directions, to curse the industrious. In the same way in dealing with this fungus one neglected orchard may furnish spores enough to reinfect all the surrounding orchards. In union only is there anything like safety. On the start it will be hopeless to expect united effort but this will come in time. Men who will not practice well-established rules of orchard hygiene ought to abandon fruit-growing. They are behind the times and in the wrong calling. Successful fruit-growing requires men of brains and decision. Prices are low, competition is severe, and, if any money is to be made, this business must be conducted intelligently in the light of all the knowledge we can get. Even with united and unremitting zeal no more can be expected from orchard hygiene than would be anticipated from like efforts directed toward the extermination of a weed. With these provisos, it may be said that this method is full of hope. It is worth trying even if neighbors will not lend a helping hand, especially if other orchards are somewhat remote. Whether it will *pay* to struggle alone must depend on various contingencies, especially the price of fruit and the cost of labor. I am inclined to think it will, but this can be determined only by actual trial.

The proposed remedy is easy to put into operation. Every year when peaches are being picked a little additional labor would suffice to remove all the rotted and rotting peaches. The earlier this is begun the more secure will be the varieties next in order of ripening. Moreover, if at any time during the season a hot or rainy spell supervenes, and the fruit shows a tendency to rot before it is ripe, men should be put into the orchard *immediately* with instructions to remove every trace of rotting fruit. The same trees must be gone over again the next day, or the day after at furthest, so as to secure and remove all freshly rotted fruits, 24 to 36 hours being ample time to develop incipient cases not noticeable on the first gathering. The work must be done *very quickly and very thoroughly* in order that the rotting fruits may be removed and buried before the spores appear upon their surface to scatter destruction everywhere and undo all that has been done previously. Finally, in the late autumn, after the leaves have fallen, the entire orchard should be re-examined and all dried peaches lying on the earth or still clinging to the branches should be scrupulously removed and buried or burned.

I have so much confidence in the ultimate success of this method that I can not too earnestly urge its practice upon peach growers. If it were followed systematically for a series of years I believe the loss from peach rot would be reduced to inconsiderable proportions. This granted it is unnecessary to enlarge upon the resulting benefit to growers.

In regard to fungicides there is yet little to be said. Some experiments designed to preserve the fruit while on its way to market have been made by various growers. These indicate a possibility of delaying the decay some days by dipping into harmless sulphur compounds, *e. g.*, solutions of liver of sulphur, or of sulphur and cooking soda, and drying before packing into baskets for shipment. As an experiment, dry sulphur might also be dusted on the gathered fruit. All these methods are open to objection on the double score of cost and uncertainty. It is possible also that the spraying of some fungicide upon the trees and fruit will be found efficacious, but up to this time no fungicidal treatment appears to have been worked out to any satisfactory conclusion. Von Thümen recommends the repeated dry dusting of trees and fruit with sulphur, beginning in July. This might possibly answer the purpose, but the expense involved would be very considerable. So far as I know it has never been tried in this country on any extended scale, but some experiments made this season by J. D. Husted, of Vineyard, Ga., gave favorable results. He dusted on sulphur twice, three weeks apart, using a bellows, and making the first application when the peaches were half grown. Probably as many as four applications should be made.

On the whole, the best hope of success appears to be offered by the method first outlined, *i. e.*, the prompt and persistent removal of sources of infection by the destruction of all rotting fruit; but the two methods might be combined.

## ANOTHER SPHÆROTHECA UPON PHYTOPTUS DISTORTIONS.

By Byron D. Halsted.

As an addition to the note in the Journal of Mycology (Vol. 5, No. 1) upon the *Sphærotheca phytoptophila*, K. & S., found in the buds of the distorted branches of the hackberry (*Celtis occidentalis*), it may be said that the mature perithecia of the *Sphærotheca pruinosa*, C. & P., were found in abundance in the malformed inflorescences of the common sumach (*Rhus glabra*), caused by some species of a phytoptus mite. As far as can be learned the ascigerous fruit of this *Sphærotheca* is rare, although the leaves may frequently be attacked by the mildew and abound in the conidia. What is most interesting is that the fully developed perithecia were found among the abortive flowers as early as the middle of July and at a time when no fruit of this sort need be expected upon the leaves. This is another case of the abnormally developed part of a host being the most favorable for the growth of a parasitic fungus. It is perhaps to be expected that the tissue of a plant rendered more soft and irregular upon the exposed surface would supply the conditions for a vigorous growth of a mildew that is practically superficial. The spores would more easily be held in the niches of the distorted inflorescence and find the proper conditions for a rapid growth. It is also interesting to observe that this is also another *Sphærotheca*, which genus may have a particular fondness for the distortions of mites Have other phytoptous growths been found infested with members of the *Erysipheæ?*